Amendments to the Claims

This listing of claims will replace all prior versions and listings, of claims in the present application

Listing of Claims:

Claims 1 -15 cancelled

Claim 16 (original) A method for fabricating a multiple electrode device comprising at least one pair of electrodes that form at least one junction and at least one connector species connecting said pair of electrodes in said junction, said junction having a functional dimension in nanometers or micrometers, wherein said at least one connector species comprises said bistable molecule provided with at least one photosensitive functional group for patterning said connector species, said method comprising:

(a) forming a first set of said electrodes on a substrate;

(b) depositing a film of said bistable molecule(s) including said photosensitive group prior to said depositing;

(c) exposing portions of said bistable molecular film to desired radiation; and

(d) removing unwanted portions of said bistable molecular film to provide a photopatterned molecule.

Claim 17 (original) The method of Claim 16 wherein said at least one pair of electrodes comprises a positive terminal and a negative terminal and wherein said method further comprises, after step (d):

(e) depositing a second set of said electrodes adjacent said first set of said electrodes.

Claim 18 (original) The method of Claim 17 wherein said second set of electrodes is deposited above said first set of electrodes, at a non-zero angle thereto.

Claim 19 (original) The method of Claim 17 wherein said second set of electrodes is deposited in the same plane as said first set of electrodes.

Claim 20 (original) The method of Claim 17 wherein said at least one pair of electrodes comprises said first set of electrodes and at least one probe addressing tip.

Claim 21 (original) The method of Claim 16 wherein said photosensitive functional group is sensitive to ultraviolet, electron-beam, or X-ray radiation.

Claim 22 (original) The method of Claim 16 wherein said bistable molecule comprises a main chain and at least one pendant group and wherein at least one photosensitive functional group is attached either to said main chain or to said pendant group.

Claim 23 (original) The method of Claim 22 wherein one said photosensitive group is attached to at least one end of said bistable molecule.

Claim 24 (original) The method of Claim 22 wherein said photosensitive group is selected from the group consisting of α-carboxy-2-nitrobenzyl; 1-(2-nitrophenyl)ethyl; 4,5-dimethoxy-2-nitrobenzyl; 1-(4,5-dimethoxy-2-nitrophenyl)ethyl; (4,5-dimethoxy-2-nitrobenzyloxy)carbonyl; 5-carboxymethoxy-2-nitrobenzyl; [(5-carboxymethoxy-2-nitrobenzyl)oxy]carbonyl; desoxybenzoinyl; and anthraquinon-2-ylmethoxycarbonyl.

Claim 25 (original) The method of Claim 16 wherein said molecule evidences switching based on electric (E) field induced band gap change, selected from the group consisting of:

(1) an E-field induced rotation of at least one rotatable section (rotor) of a molecule to change the band gap of the molecule (rotor/stator configuration);

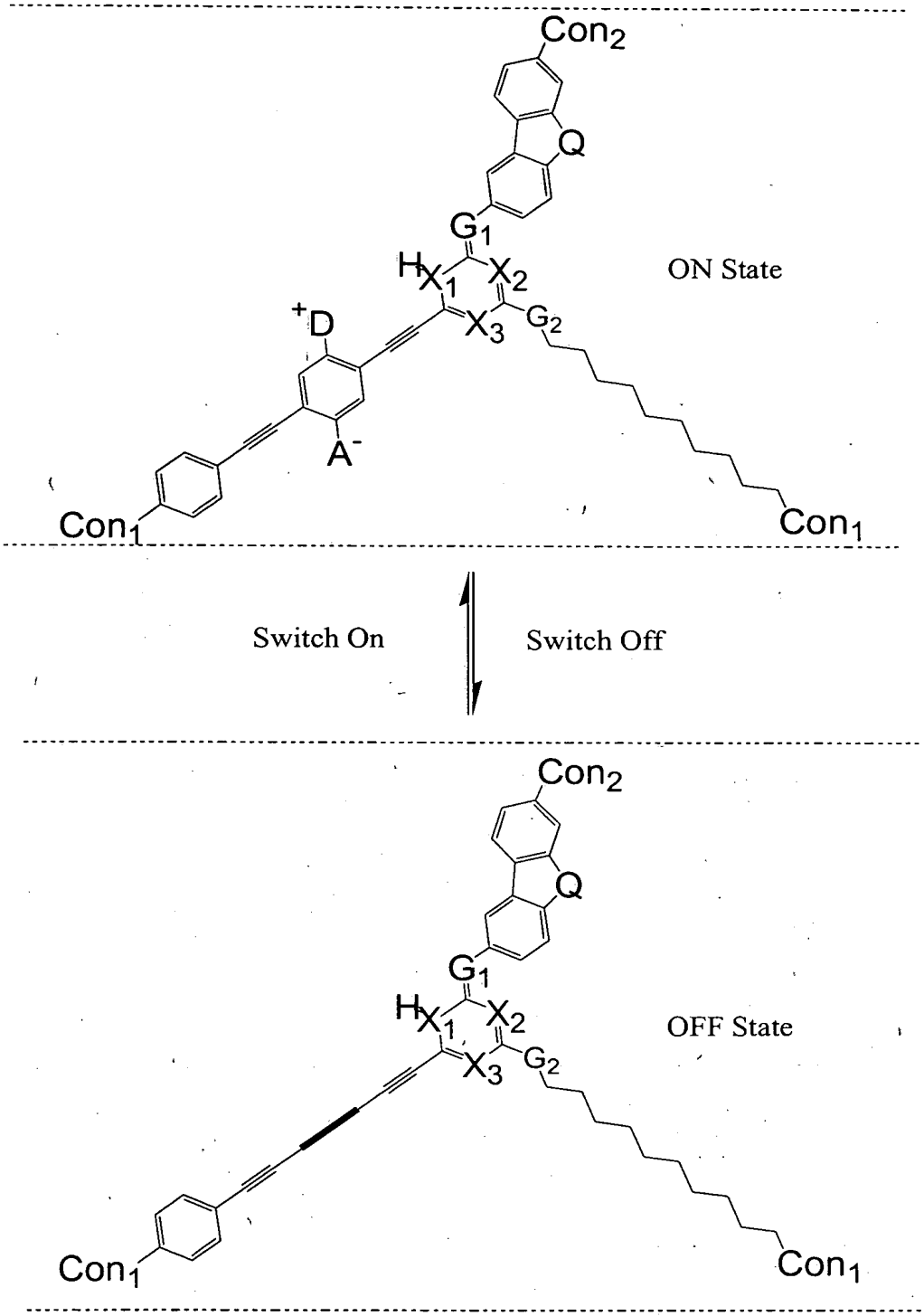
(2) E-field-induced charge separation or recombination of the molecule via chemical bonding change to alter the band gap:

(2a) E-field-induced band gap change caused by the change of extended conjugation via charge separation or recombination accompanied by increasing or decreasing π– and/or p-electron localization;

(2b) E-field-induced band gap change caused by a change of extended conjugation via charge separation or recombination and π-bond breaking or formation; and

(3) E-field-induced band gap change via molecular folding or stretching.

Claim 26 (original) The method of Claim 25 wherein said bistable molecule comprises:


Con2
Q
G1
X1
X2
X3
G2
+D
A-
Con1
Con1
ON State
Switch On
Switch Off
Con2
Q
G1
X1
X2
X3
G2
Con1
Con1
OFF State

Example 1b

where:

A^- is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

Con_1 and Con_2 are connecting units between one molecule and another molecule or between a molecule and a substrate, said connecting units containing an attaching unit and at least one of said connecting units containing said photosensitive group, wherein said photosensitive group is selected from the group consisting of: photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitive carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring system(s) with at least one hetero-atom selected from the group consisting of N, O, S, B, and P and wherein the attaching unit is selected from the group consisting of carboxylic acid and its derivatives; sulfuric acid and its derivatives; phosphoric acid and its derivatives; hetero atoms selected from the group consisting of N, O, S, B, Se, and P; functional groups with at least one of said hetero atoms; hydrocarbons; and substituted hydrocarbons;

X_1, X_2, X_3 are tuning units built into the ring system which serve to tune the electronic properties, the optical properties, or both, of the bistable molecule as well as to that the ring system undergoes a smooth and desired tautomerization transition under the influence of an applied external E-field, wherein the tuning units are

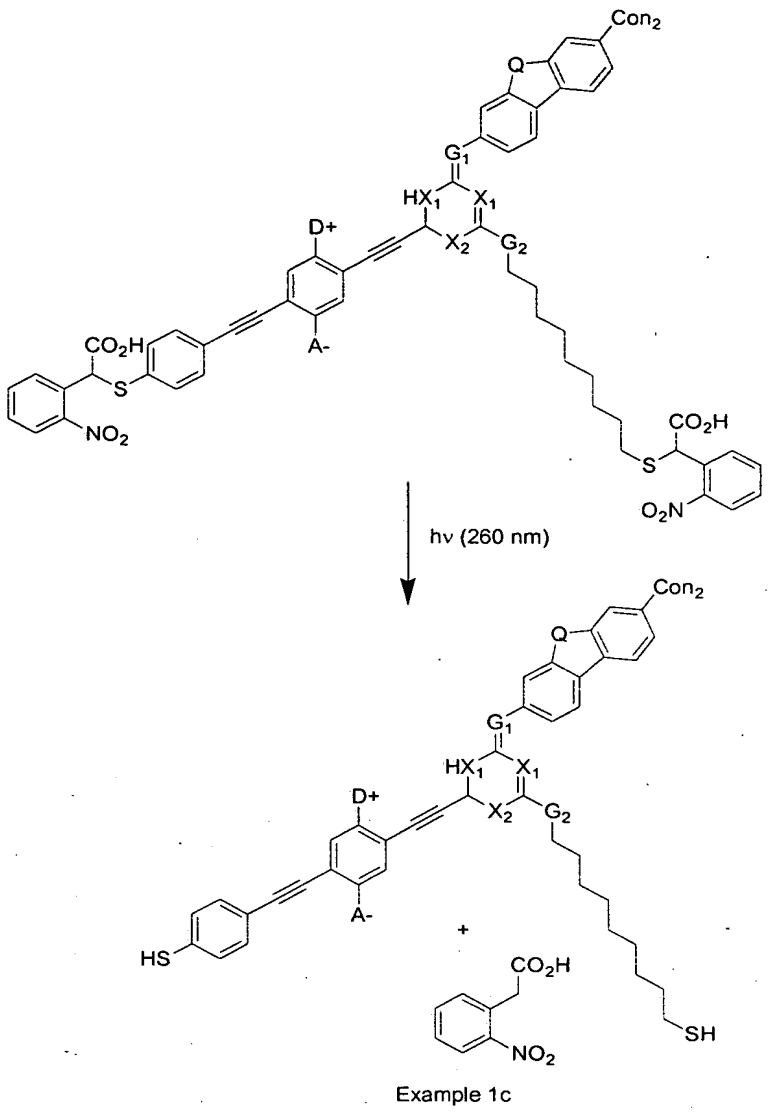
selected from the group consisting of a hetero atom selected from the group consisting of N, P, and As; hydrocarbons; and substituted hydrocarbons;

G_1 and G_2 are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more fragments to achieve desired molecular properties, wherein the bridging groups are either (a) selected from the group consisting of hetero atoms selected from the group consisting of N, O, S, and P; functional groups with at least one of said hetero atoms; saturated or unsaturated hydrocarbons; and substituted hydrocarbons or (b) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

Q is a connecting unit between two phenyl rings, selected from the group consisting of S, O, NH, NR, hydrocarbons, and substituted hydrocarbons; and

H is a hydrogen atom.

Claim 27 (original) The method of Claim 25 wherein said bistable molecule comprises:



Example 1c

where:

A^- is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

Con_2 is a connecting unit between one molecule and another molecule or between a molecule and a substrate, said connecting unit containing an attaching unit and said photosensitive group, wherein said photosensitive group is selected from the group consisting of: photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitve carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring system(s) with at least one hetero-atom selected from the group consisting of N, O, S, B, and P and wherein the attaching unit is selected from the group consisting of carboxylic acid and its derivatives; sulfuric acid and its derivatives; phosphoric acid and its derivatives; hetero atoms selected from the group consisting of N, O, S, B, Se, and P; functional groups with at least one of said hetero atoms; hydrocarbons; and substituted hydrocarbons;

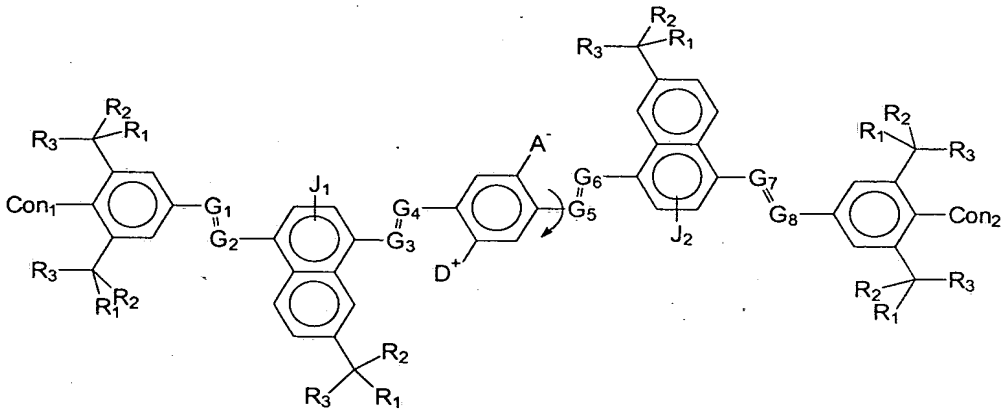
X_1, X_2, X_3 are tuning units built into the ring system which serve to tune the electronic properties, the optical properties, or both, of the bistable molecule as well as to ensure that the ring system undergoes a smooth and desired tautomerization transition under the influence of an applied external E-field, wherein the tuning units are selected from the group consisting of a hetero atom selected from the group consisting of N, P, and As, hydrocarbons, and substituted hydrocarbons;

G_1 and G_2 are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more fragments to achieve desired molecular properties, wherein the bridging groups are either (a) selected from the group consisting of hetero atoms selected from the group consisting of N, O, S, and P ; functional groups with at least one of said hetero atoms; saturated or unsaturated hydrocarbons; and substituted hydrocarbons or (b) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

Q is a connecting unit between two phenyl rings, selected from the group consisting of S, O, NH, NR, hydrocarbons, and substituted hydrocarbons; and

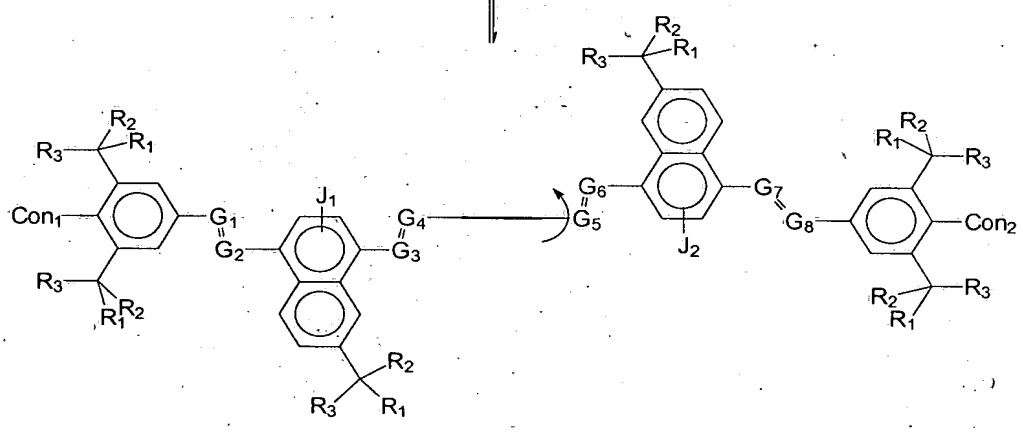
H is a hydrogen atom.

Claim 28 (original) The method of Claim 25 wherein said bistable molecule comprises:



On State (More Conductive State)

Switch On Switch Off



Off State (Less Conductive State)

where:

A⁻ is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

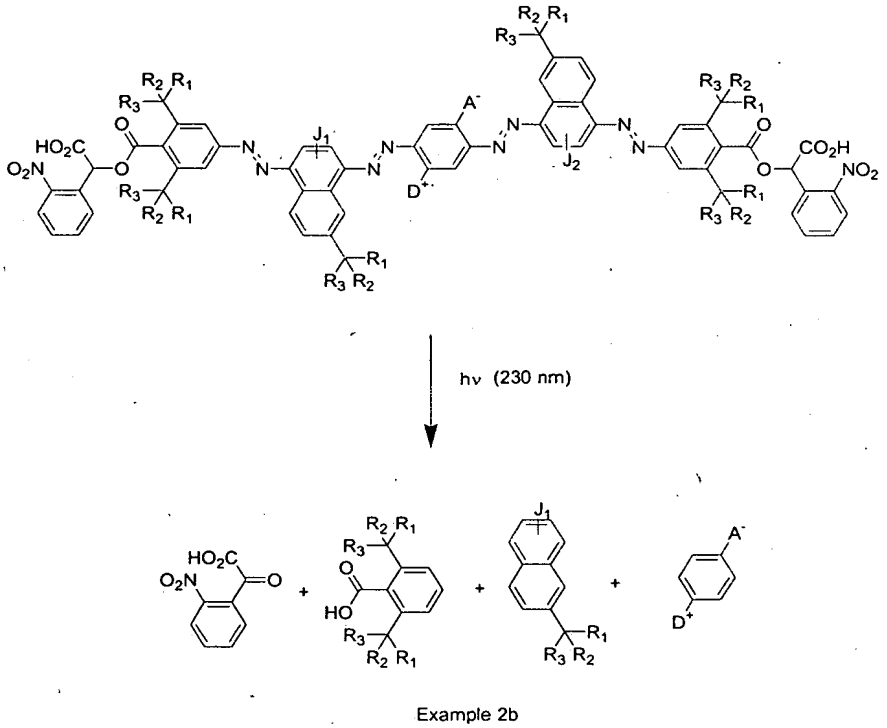
G_1=G_2, G_3=G_4, G_5=G_6, and G_7=G_8 are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more conjugated rings to achieve desired electronic properties, wherein the bridging groups are either (a) photosensitive functional groups or (b) selected from the group consisting of hetero atoms selected from the group consisting of N, O, S, and P ; functional groups with at least one of said hetero atoms; saturated or unsaturated hydrocarbon;, and substituted hydrocarbons, or (c) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

Con_1 and Con_2 are connecting units between one molecule and another molecule or between a molecule and a substrate, said connecting units containing an attaching unit and at least one of said connecting units containing said photosensitive group, wherein said photosensitive group is selected from the group consisting of: photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitive carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring system(s) with at least one hetero-atom selected from the group consisting of N, O, S, B, and P and wherein the attaching unit is selected from the group consisting of carboxylic acid and its derivatives; sulfuric acid and its derivatives; phosphoric acid and its derivatives; hetero atoms selected from the group consisting of N, O, S, B, Se, and P; functional groups with at least one of said hetero atoms; hydrocarbons; and substituted hydrocarbons;

R_1, R_2, and R_3 are spacing groups selected from the group consisting of (a) hydrogen, (b) saturated or unsaturated hydrocarbons, and (c) substituted hydrocarbons; and

J_1 and J_2 are tuning groups to provide at least one appropriate functional effect selected from the group consisting of inductive effects, resonance effects, and steric effects; said tuning groups being selected from the group consisting of (a) hydrogen, (b) hetero atoms selected from the group consisting of N, O, S, P, B, F, Cl, Br, and I, (c) functional groups with at least one of said hetero atoms, (d) saturated or unsaturated hydrocarbons, and (e) substituted hydrocarbons.

Claim 29 (original) The method of Claim 25 wherein said bistable molecule comprises:



Example 2b

where:

A⁻ is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g)

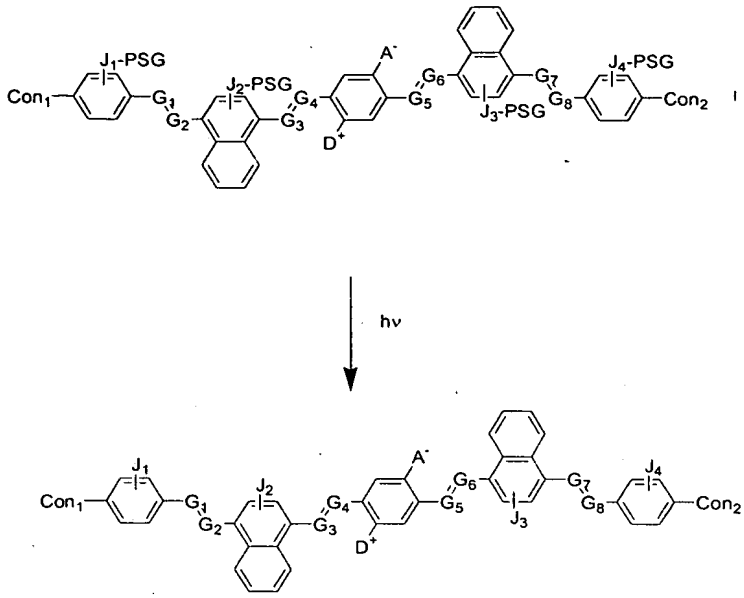
functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

R_1, R_2, and R_3 are spacing groups selected from the group consisting of (a) hydrogen, (b) saturated or unsaturated hydrocarbons, and (c) substituted hydrocarbons; and

J_1 and J_2 are tuning groups to provide at least one appropriate functional effect selected from the group consisting of inductive effects, resonance effects, and steric effects; said tuning groups being selected from the group consisting of (a) hydrogen, (b) hetero atoms selected from the group consisting of N, O, S, P, B, F, Cl, Br, and I, (c) functional groups with at least one of said hetero atoms, (d) saturated or unsaturated hydrocarbons, and (e) substituted hydrocarbons.

Claim 30 (original) The method of Claim 25 wherein said bistable molecule comprises:



Example 3b

where:

A^- is an Acceptor group comprising an electron-withdrawing group selected from the group consisting of- (a) carboxylic acid and its derivatives, (b) sulfuric acid and its derivatives, (c) phosphoric acid and its derivatives, (d) nitro, (e) nitrile, (f) hetero atoms selected from the group consisting of N, O, S, P, F, Cl, and Br, (g) functional groups with at least one of said hetero atoms, (h) saturated or unsaturated hydrocarbons, and (i) substituted hydrocarbons;

D^+ is a Donor group comprising an electron-donating group selected from the group consisting of (a) hydrogen, (b) amines, (c) OH, (d) SH, (e) ethers, (f) saturated or unsaturated hydrocarbons, (g) substituted hydrocarbons, and (h) functional groups with at least one hetero atom selected from the group consisting of B, Si, I, N, O, S, and P; wherein said Donor group is more electropositive than said Acceptor group;

G_1=G_2, G_3=G_4, G_5=G_6, and G_7=G_8 are bridging groups for connecting stator and rotor portions of said bistable molecule or for connecting two or more conjugated rings to achieve desired electronic properties, wherein the bridging groups are either (a) photosensitive functional groups, or (b) selected from the group consisting of

hetero atoms selected from the group consisting of N, O, S, and P; functional groups with at least one of said hetero atoms; saturated or unsaturated hydrocarbons; and substituted hydrocarbons, or (c) selected from the group consisting of a single atom bridge and a direct sigma bond between said rotor and stator portions;

Con_1 and Con_2 are connecting units between one molecule and another molecule or between a molecule and a substrate, said connecting units containing an attaching unit and at least one of said connecting units containing said photosensitive group, wherein said photosensitive group is selected from the group consisting of: photosensitive azo, photosensitive ester, photosensitive ether, photosensitive amide, photosensitive imide, photosensitive amine, photosensitive imine, photosensitive carbonate, photosensitive carbamate, photosensitive thio-ether, photosensitive thio-ester, photosensitive isocyanides, and photosensitive hetero-ring system(s) with at least one hetero-atom selected from the group consisting of N, O, S, B, and P and wherein the attaching unit is selected from the group consisting of carboxylic acid and its derivatives; sulfuric acid and its derivatives; phosphoric acid and its derivatives; hetero atoms selected from the group consisting of N, O, S, B, Se, and P; functional groups with at least one of said hetero atoms; hydrocarbons; and substituted hydrocarbons;

J_1, J_2, J_3, and J_4 are tuning groups which contain solvent functional groups selected from the group consisting of OH, NHR, COOH, and CN, where R is alkyl or aryl, wherein J_1-PSG, J_2-PSG, J_3-PSG, and J_4-PSG are linkages of said tuning groups with said photosensitive groups and are selected from the group consisting of ether, ester, carbonate, amide and carbamate linkages.